IN THE CLAIMS

This listing of claims replaces all prior versions, and listings, in this application.

Claims 1-70 (canceled)

71. (currently amended) A process for the preparation of an epiK5-N,O-oversulfate-derivative, which comprises

(a) treating an epiK5-N-sulfate-derivative, in acidic form, with tertiary or quaternary organic base, letting the reaction mixture to stand for a time period of 30-60 minutes at a pH of approximately 7 and isolating its salt ~~is isolated~~ with said organic base;

(b) treating said salt of the ~~organic base of said~~ epiK5-N-sulfate-derivative with an O-sulfation reagent under ~~in~~ the conditions of O-oversulfation;

(c) treating said oversulated salt ~~a salt of tertiary or quaternary organic base of epiK5-amine-O-oversulfate-derivative thus obtained~~ with a reagent of an N-sulfation reagent and isolating the epiK5-N,O-oversulfate-derivative thus obtained.

72. (previously presented) Process according to claim 71, wherein said epiK5-N,O-oversulfate-derivative is isolated in sodium salt form and optionally transformed into another chemically or pharmaceutically acceptable salt.

73. (previously presented) Process according to claim 71, wherein in step (a) tetrabutylammonium hydroxide is used as an organic base.

74. (previously presented) Process according to claim 71, wherein in step (b) the O-oversulfation is carried out in dimethylformamide using 2-4 moles of O-sulfation reagent per available OH per disaccharide at a temperature of 40-60°C for 15-20 hours.

75. (previously presented) Process according to claim 71, wherein an epiK5-N-sulfate-derivative is used as starting material having a mean molecular weight from approximately 1,000 to approximately 25,000.

76. (currently amended) Process according to claim 75, wherein ~~characterized in that~~ said starting epiK5-N-sulfate-derivative is 40-60% C5-epimerized.

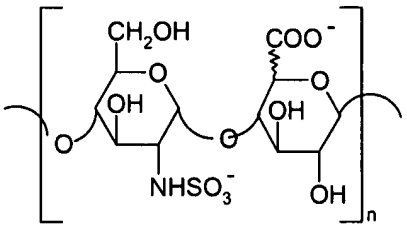
77. (previously presented) Process according to claim 71, wherein said starting epiK5-N-sulfate-derivative has a mean molecular weight from approximately 1,500 to approximately 25,000.

78. (currently amended) Process according to claim 77, wherein said starting epiK5-N-sulfate-derivative has a mean molecular weight between 10,000 and 25,000.

79. (previously presented) Process according to claim 71, wherein said starting material has a mean molecular weight from approximately 1,000 to approximately 12,000.

80. (previously presented) Process according to claim 79, wherein said starting material has a mean molecular weight from approximately 1,500 to approximately 8,000.

81. (previously presented) Process according to claim 71, wherein an epiK5-N-sulfate-derivative is used as starting material consisting of a chain mixture in which at least 90% of said chains have the formula I



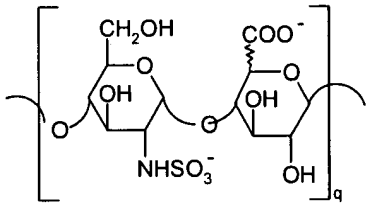
(I)

in which the uronic units are 20-60% consisting of iduronic acid, n is an integer from 2 to 100 and the corresponding cation is chemically or pharmaceutically acceptable.

82. (previously presented) Process according to claim 81, wherein said starting material consists of a chain mixture in which at least 90% of said chains have the formula I, in which the uronic units are 40-60% consisting of iduronic acid.

83. (previously presented) Process according to claim 81, wherein, in the formula I, n represents an integer from 3 to 100.

84. (previously presented) Process according to claim 81, wherein said starting material consists of a chain mixture in which at least 90% of said chains have the formula I'

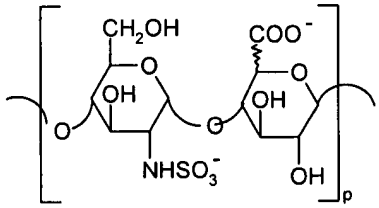


(I')

in which the uronic units are 20-60% consisting of iduronic acid, q is an integer from 2 to 20 and the corresponding cation is chemically or pharmaceutically acceptable.

85. (previously presented) Process according to claim 84, wherein said starting material consists of a chain mixture in which at least 90% of said chains have the formula I', in which n is an integer from 3 to 15.

86. (previously presented) Process according to claim 81, wherein said starting material consists of a chain mixture in which the preponderant species has the formula I'a

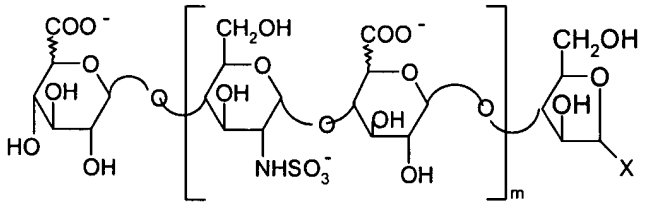


(I'a)

in which the uronic units are 60-40% consisting of glucuronic acid and 40% to 60% of iduronic acid, p is an integer from 4 to 8 and the corresponding cation is chemically or pharmaceutically acceptable.

87. (previously presented) Process according to claim 86, wherein the mean molecular weight of said starting material is from approximately 2000 to approximately 4000.

88. (previously presented) Process according to claim 86, wherein said starting material consists of a chain mixture in which the preponderant species has the formula I'b



(I'b)

in which X is hydroxymethyl, m is 4, 5 or 6 and the glucuronic and iduronic units are present alternately, starting with a glucuronic or iduronic unit.

89. (currently amended) Process according to claim 71, wherein said starting material comes from [[a]] N-deacetylation and from [[a]] N-sulfation of a K5 that is basically free of lipophilic substances.

90. (currently amended) An epiK5-N,O-oversulfate-derivative having an iduronic acid content of 20-60%, a mean molecular weight from approximately 2,000 to approximately 45,000 and a sulfation degree of at least 4, or one of its chemically or pharmaceutically acceptable salts, said derivative being basically inactive for ~~on the~~ coagulation ~~parameters~~.

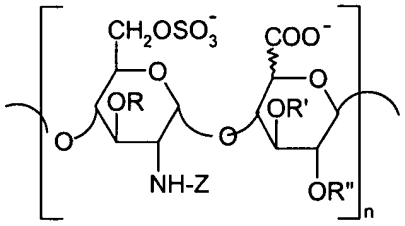
91. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 90, whose mean molecular weight is between approximately 15,000 and approximately 45,000.

92. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 90, whose mean molecular weight is between approximately 4,500 and approximately 8,500.

93. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 90, wherein said degree of sulfation is from 4 to 4.6.

94. (previously presented) An epiK5-N,O-oversulfate-derivative according to Claim 90, which is 100% 6-O-sulfated and 50-80% 3-O-sulfated in its gliucosamine units, 5-10% O-monosulfated in glucuronic units, 10-15% 3-O-monosulfated in iduronic units and 2,3-di-O-sulfated in the remaining uronic units.

95. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 90 consisting of a chain mixture in which at least 90% of said chains have the formula III



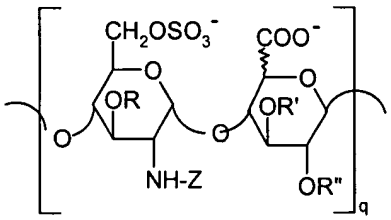
(III)

in which the uronic units are 20-60% consisting of iduronic acid, R, R', R" represent hydrogen or SO_3^-, R being SO_3^- in at least 40% of said chain mixture, Z is a SO_3^- group, n is an integer from 2 to 100, the degree of sulfation is at least 4 and the corresponding cation is chemically or pharmaceutically acceptable.

96. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 95, consisting of a chain mixture in which at least 90% of said chains have the formula III, in which the uronic units are 40-60% iduronic acid.

97. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 95, consisting of a chain mixture in which at least 90% of said chains have the formula III, in which n is an integer from 3 to 100.

98. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 95, which is a LMW-epiK5-N,O-oversulfate consisting of a chain mixture in which at least 90% of said chains have the formula III'



(III')

in which the uronic units are 20-60% consisting of iduronic acid, q is an integer from 2 to 20, R, R' and R" represent hydrogen or a SO_3^- group, Z is SO_3^-, for a sulfation degree of from 4 to 4.6, and the corresponding cation is one chemically or pharmaceutically acceptable ion.

99. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 98, consisting of a chain mixture in which at least 90% of said chains have the formula III' in which q is an integer from 3 to 15.

100. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 99, consisting of a chain mixture in which at least 90% of said chains have the formula III' in which the uronic units are 40-60% consisting of iduronic acid.

101. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 100, whose iduronic acid content is 50-55%.

102. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 98, consisting of a chain mixture in which at least 90% of said chains have the formula III' in

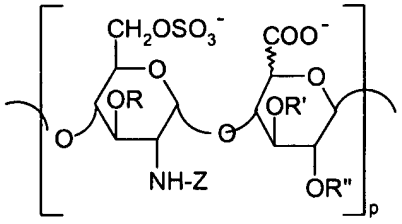
which R is at least 40% SO_3^-, R' and R" are both SO_3^- or one is hydrogen and the other is 5-10% SO_3^- in glucuronic acid and 10-15% SO_3^- in iduronic acid.

103. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 102, having a mean molecular weight from approximately 2,000 to approximately 16,000.

104. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 103, having a molecular weight from approximately 4,500 to approximately 9,000.

105. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 102, consisting of a chain mixture in which at least 90% of said chains have the formula III' in which R is 50-80% SO_3^-.

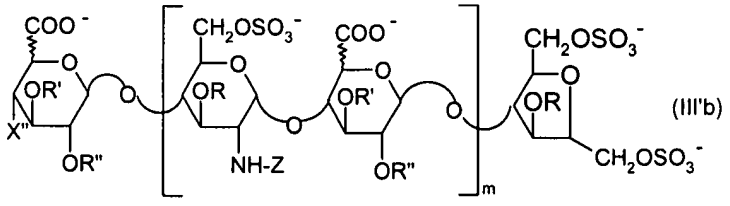
106. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 101, consisting of a chain mixture in which the preponderant species has the formula III'a



(III'a)

in which the uronic units are 20-60% consisting of iduronic acid, p is an integer from 4 to 8, Z is SO_3^- , R, R' and R" are hydrogen or SO_3^-, for a degree of sulfation from 4 to 4.6 and the corresponding cation is chemically or pharmaceutically acceptable.

107. (previously presented) A LMW-epiK5-N,O-oversulfate according to claim 102, consisting of a chain mixture in which the preponderant species has the formula III'b



(III'b)

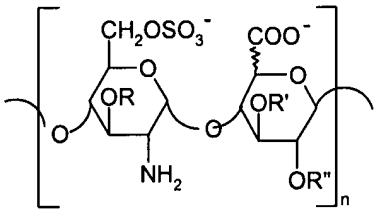
in which R, R' and R" are hydrogen or SO_3^-, Z is SO_3^-, X" is OH or OSO_3^-, m is 4, 5 or 6, for a degree of sulfation from 4 to 4.6, the glucuronic and iduronic units are present alternately, starting with a glucuronic or iduronic unit, and the corresponding cation is a chemically or pharmaceutically acceptable ion.

108. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 90, wherein said chemically or pharmaceutically acceptable salt is an alkaline metal, alkaline-earth metal, ammonium, (C_1-C_4)tetraalkylammonium, aluminum or zinc salt.

109. (previously presented) An epiK5-N,O-oversulfate-derivative according to claim 108, wherein said chemically or pharmaceutically acceptable salt is the salt of sodium, calcium or tetrabutylammonium.

110. (previously presented) An epiK5-amine-O-oversulfate-derivative whose iduronic acid content is 20-60% of the total of the uronic acids, having a mean molecular weight from approximately 3,500 to approximately 40,000 and a sulfation degree of from 3.55 to 4, or one of its chemically or pharmaceutically acceptable salts.

111. (previously presented) An epiK5-amine-O-oversulfate-derivative according to claim 110, consisting of a chain mixture in which at least 90% of said chains have the formula II



(II)

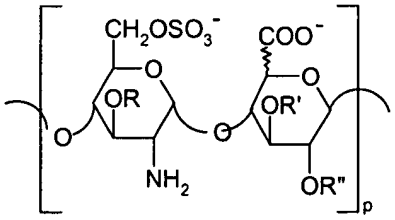
in which the uronic units are 20-60% consisting of iduronic acid, n is an integer from 2 to 100, R, R' and R" are hydrogen or SO_3^-, the degree of sulfation is from 3.55 to 4 and the corresponding cation is chemically or pharmaceutically acceptable.

112. (previously presented) An epiK5-amine-O-oversulfate-derivative according to claim 111, of formula II, wherein n represents an integer from 3 to 100.

113. (previously presented) An epiK5-amine-O-oversulfate-derivative according to claim 111, consisting of a chain mixture in which at least 90% of said chains have the formula II in which the uronic units are 40-60% consisting of iduronic acid, with a mean molecular weight from approximately 2,000 to approximately 40,000, R is at least 40%, SO_3^-, R' and R" are both SO_3^- or one is hydrogen and the other is 5-10% SO_3^- in monosulfate glucuronic acid and 10-15% SO_3^- in monosulfate iduronic acid.

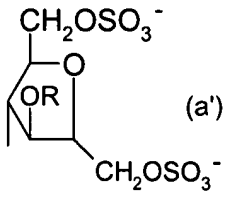
114. (previously presented) An epiK5-amine-O-oversulfate-derivative according to claim 111, which is a LMW-epiK5-amine-O-oversulfate consisting of a chain mixture in which at least 90% of said chains have the formula II in which the uronic units are 40-60% consisting of iduronic acid, R is at least 40%, SO_3^-, R' and R" are both SO_3^- or one is hydrogen and the other is 5-10% SO_3^- in glucuronic acid and 10-15% SO_3^- in iduronic acid, n is an integer from 3 to 15, with a mean molecular weight from approximately 4,000 to approximately 8,000 and the corresponding cation is chemically or pharmaceutically acceptable.

115. (previously presented) A LMW-epiK5-amine-O-oversulfate according to claim 134, consisting of a chain mixture in which the preponderant species has the formula II'a



(II'a)

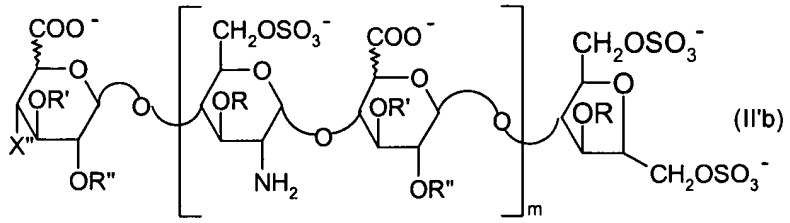
in which the uronic units are 20-60% consisting of iduronic acid, p is an integer from 4 to 8, R, R' and R" are hydrogen or SO_3^-, bearing a sulfated 2,5-anhydromannitol unit of structure (a')



(a')

wherein R is hydrogen or SO_3^- at the reducing end of the majority of said chains.

116. (previously presented) A LMW epiK5-amine-O-oversulfate according to claim 115, consisting of a chain mixture in which the preponderant species is a compound of formula II'b



(II'b)

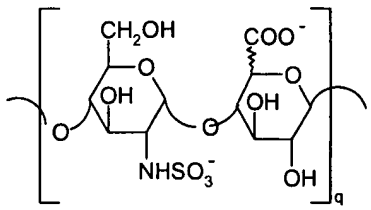
in which the uronic units are 40-60% consisting of iduronic acid, m is 4, 5 or 6, R, R' and R" are hydrogen or SO_3^-, X" is OH or OSO_3^-, for a sulfation degree of at least 3.4, the iduronic units being present alternately, starting with a glucuronic or iduronic unit.

117. (Previously presented) A LMW-epiK5-N-sulfate virtually free of NH_2 and N-acetyl groups, having an iduronic acid content from 20 to 60% and a mean molecular weight from approximately 1,500 to approximately 12,000, or one of its chemically or pharmaceutically acceptable salts.

118. (previously presented) A LMW-epiK5-N-sulfate according to claim 117, whose iduronic acid content is from 40 to 60% and the mean molecular weight is from approximately 1,500 to approximately 10,000.

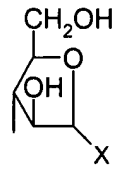
119. (previously presented) A LMW-epiK5-N-sulfate according to claim 117, whose iduronic acid content is 50-55% and the mean molecular weight is from approximately 1,500 to approximately 7,500.

120. (previously presented) A LMW-epiK5-N-sulfate according to claim 117, consisting of a chain mixture in which at least 90% of said chains have the formula I'



(I')

in which the uronic units are 20-60% consisting of iduronic acid, q is an integer from 2 to 20, bearing a 2,5-anhydromanno unit of structure (a)



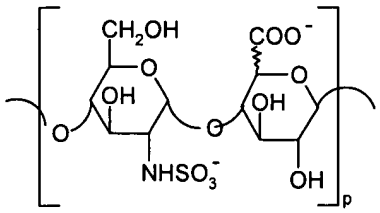
(a)

wherein X is formyl or hydroxymethyl, at the reducing end of the majority of said chains, and the corresponding cation is chemically or pharmaceutically acceptable.

121. (previously presented) A LMW-epiK5-N-sulfate according to claim 120, consisting of a chain mixture in which at least 90% of said chains have the formula I', in which the uronic units are 40-60% iduronic acid.

122. (previously presented) A LMW-epiK5-N-sulfate according to claim 120, consisting of a chain mixture in which at least 90% of said chains have the formula I', in which n is an integer from 3 to 15.

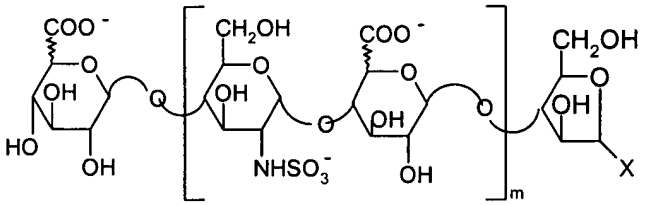
123. (previously presented) A LMW-epiK5-N-sulfate according to claim 120, consisting of a chain mixture in which the preponderant species has the formula I'a



(I'a)

in which the uronic units are 60-40% consisting of glucuronic acid and 40% to 60% iduronic acid, p is an integer from 4 to 8 and the corresponding cation is chemically or pharmaceutically acceptable.

124. (previously presented) A LMW-epiK5-N-sulfate according to claim 121, consisting of a chain mixture in which the preponderant species has the formula I'b



(I'b)

in which X is hydroxymethyl, m is 4, 5 or 6, the corresponding cation is a chemically or pharmaceutically acceptable ion and the glucuronic and iduronic units are present alternately, starting with a glucuronic or iduronic unit.

125. (previously presented) A LMW-epiK5-N-sulfate according to claim 117, wherein said salt is selected from the group consisting of alkaline metals, alkaline-earth metals, ammonium, (C_1-C_4)tetraalkylammonium, aluminum and zinc salts.

126. (previously presented) A LMW-epiK5-N-sulfate according to claim 125, wherein said salt is sodium, calcium or tetrabutylammonium salt.

127. (currently amended) A process for the preparation of a LMW-epiK5-N-sulfate, which comprises subjecting a K5-N-sulfate, in any one order,

(i) to C5-epimerization with a D-glucuronyl C5-epimerase isolated, purified and in solution or immobilized on a solid support, at a pH of approximately 7, at a

temperature of approximately 30°C and for a time period of 12-24 hours in the presence of at least one bivalent ion selected from the group consisting of ~~among~~ calcium, magnesium, barium and manganese; and

(ii) to nitrous depolymerization optionally followed by reduction.

128. (Previously presented) Process according to claim 127, which is carried out in the order (i)-(ii).

129. (previously presented) Process according to claim 127, which is carried out in the order (ii)-(i).

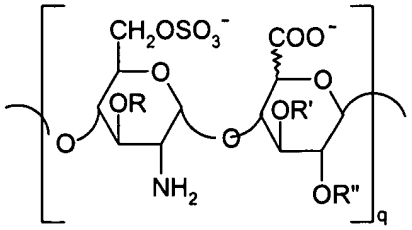
130. (previously presented) Process according to claim 129, wherein the product obtained upon termination of the depolymerization is a LMW-K5-N-sulfate which is directly subjected to C5-epimerization.

131. (previously presented) Process according to claim 130, wherein said LMW-K5-N-sulfate has a mean molecular weight of more than 4,000.

132. (previously presented) A pharmaceutical composition including, as an active ingredient, a pharmacologically active amount of an epiK5-N,O-oversulfate-derivative according to claim 90, in mixture with a pharmaceutical excipient.

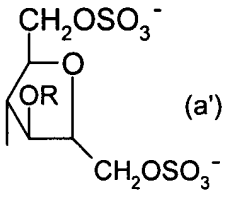
133. (previously presented) A cosmetic composition including an effective amount of an epiK5-N,O-oversulfate-derivative according to claim 90, in mixture with a cosmetic excipient.

134. (currently amended) A LMW-epiK5-amine-O-oversulfate consisting of a mixture of chains in which at least 90% of said chains have the formula II'



(II')

in which 20-60% of the uronic acid units are those of iduronic acid, q is an integer from 2 to 20, R, R' and R" are hydrogen or SO_3^-, bearing a sulfated 2,5-anhydromannitol unit of structure (a')



(a')

wherein R is hydrogen or SO_3^-, at the reducing end of the majority of said chains, for a sulfation degree of at least 3.4, and the corresponding cation is a chemically or pharmaceutically acceptable ion.